Science Magazine Podcast

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Promo

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Music

Interviewer – Sarah Crespi

Finally today, David Grimm, online news editor for *Science*, is here to give us a rundown of some of the recent stories from our daily news site. I'm Sarah Crespi. First up, we have a story about a new tool for fighting the very last stages of cancer.

Interviewee – David Grimm

That's right, Sarah. One of the big problems with cancer is metastasis. That's when a cell breaks off from another group of cancerous cells, travels into the bloodstream, lodges itself somewhere else, and forms a new tumor there. The problem is that when these cells start breaking off, they're at very low concentrations in the bloodstream. There can be only as little as one cancer cell per billion blood cells, so they're very hard to detect. And obviously, doctors want to detect these cells as soon as possible so that they can start treatment if these cells are starting to travel around the body.

Interviewer – Sarah Crespi

So what does this new tool bring to the arsenal in fighting cancer?

Interviewee – David Grimm

Well, this new tool is something called a CTC-iChip. The CTC stands for circulating tumor cells, which are these cells that are flowing throughout the body. And the iChip is a silicon chip – and actually in this method, it's actually two silicon chips – that are the size of microscope slides, and they're etched with these really tiny channels that are no wider than a human hair. And what happens is the researchers can take a sample of blood and put in on this chip. And what the chip does is it first of all it binds to proteins that are common on red blood cells and platelets, and it keeps these cells stuck to the chip. And that only lets the cancer cells and white blood cells flow past. And then what this second chip does is it basically has these magnetic beads which stick onto the white blood cells, and therefore you've got this gamut that the blood sample's running through until at the end of it all you're left with is these circulating tumor cells.

Interviewer – Sarah Crespi

So it's a subtractive process.

Interviewee – David Grimm

Exactly.

Interviewer – Sarah Crespi
So you take out the red blood cells, the white blood cells, and then you just have these circulating tumor cells. What can you do with them once you have them?

Interviewee – David Grimm
Well first of all, it allows researchers to just take a really large volume of blood and determine whether there are any circulating tumor cells in them. So if you wanted to do a diagnostic test, you know, is my cancer starting to metastasize? Right now, that's really hard to determine in its early stages because we're just not able to detect these really minute quantities of cancer cells in the bloodstream. This test will allow doctors to really filter out those cells if they exist, so it could lead to some earlier treatments for metastasis. Also, scientists don't understand a lot about how these cells work. And to understand how something works, you really need to study a lot of them. And this method will allow researchers to collect a large number of these circulating tumor cells, and potentially that could lead to new breakthroughs in understanding how these cells work and how they cause metastasis in cancer.

Interviewer – Sarah Crespi
Now that they have this tool, what are the next steps for this research group?

Interviewee – David Grimm
Well, right now it's still two chips, and the researchers want to try to integrate it into one chip just to make the process simpler. And the other objective is to bring the cost down a bit so that this would be a simple and widely available test.

Interviewer – Sarah Crespi
Okay. Next up we have a story about a potential new drug for people who suffer from insomnia and why we might want to make the switch.

Interviewee – David Grimm
Well, some of the common insomnia drugs on the market – drugs that you may have heard of like Ambien and Lunesta – are very effective, but they have side effects. Because they sort of slow down the brain, they target these receptors in the brain or a neurotransmitter known as GABA, which is important for mood, cognition, and muscle tone. So by targeting GABA indiscriminately in the brain, these drugs not only help the brain slow down, but they also can impair cognition, they can cause amnesia, confusion, other problems with learning and memory. They've also been known to cause some pretty bizarre sleepwalking behavior. So there's a lot of sort of unpleasant side effects with these drugs. And this new study is trying to figure out is there a better drug that we can develop that could help people sleep but without all of these unwanted side effects.

Interviewer – Sarah Crespi
So in this case they weren't looking at GABA, though, they were looking at a different system involved with sleeping.

Interviewee – David Grimm

Yes. So what they targeted was a system called the orexin system. And orexin – which is also known as hypocretin – is a protein that controls wakefulness, and it's missing in people with narcolepsy. And that seemed to the researchers a good system to target, especially if you're trying to help people sleep. And they developed a drug, which they called DORA-22, that inhibits orexin. And they found that it could induce sleep as effectively as GABA. They tested in both rats and rhesus monkeys and they found that these rodents and these primates were sleeping just as well as they had on the GABA drugs. What's more is that they didn't seem to have any of the side effects. They gave these animals tests where they had to recognize objects after a certain period of time. Would they remember the objects? The monkeys had to match colors on a touch screen and to pay attention to the identity and origin of a flashing light. So these were all a bunch of tests to figure out, you know, how well are these animals thinking, how well are they remembering? And what they found was that this drug that they developed, this DORA-22, didn't seem to have any negative impact on cognition or memory.

Interviewer – Sarah Crespi
So maybe it's more specific to just sleep, as opposed to these GABA drugs. Well what about people? Has this been tried in people?

Interviewee – David Grimm
It hasn't been tried in people yet, and that's obviously the next step. What the researchers and the experts are excited about is if this works in people, not only would it be an advance over current drugs because it wouldn't have the side effects theoretically, but also the current drugs don't work for everybody. And it's sort of unclear why some drugs work for some people and some drugs don't work for other people. So scientists are always looking for additional drugs and drugs that target different pathways, because the idea is if these other drugs aren't working because they're targeting the same GABA pathway, maybe people that don't respond to those drugs would respond to this new drug instead.

Interviewer – Sarah Crespi
Great. So last up, we have a story about what happens after you take a drug and use the bathroom.

Interviewee – David Grimm
Exactly. This is actually a pretty big concern. You know, we take so many pharmaceuticals that these are bound to end up in the environment. How it happens is, as you so eloquently stated, you go to the bathroom, these chemicals find their way into sewage treatment plants, the sewage gets treated but the water ends up back in rivers and streams. And the question is what impact is that having on those ecosystems?

Interviewer – Sarah Crespi
And I think from the annual meeting we did a story about the impact on animals. So this story is taking it even further down the food chain.

Interviewee – David Grimm

This goes even deeper. This goes into the slime that sort of lives in rivers and streams. If you've ever sort of slipped on a rock when trying to cross a stream, you'll know what we're talking about. Basically these are called biofilms. These are agglomerations of bacteria, algae, and fungi, other organic matter. Slime may not seem like a very important component to the ecosystem, but it's actually really important because fish, snails, insects, they all nibble on this. And without it, these animals can starve, and that can impact the entire ecosystem.

Interviewer – Sarah Crespi
And so how do they look at the impact of drugs on slime?

Interviewee – David Grimm
Well, the researchers took some cups and they filled them with agar. And they added one kind of pharmaceutical, then covered them up with a filter, and they placed them actually in rivers and they tried to see what the impact of these drugs were on biofilms. And the researchers tested six drugs. They tested antihistamines, caffeine, an antibiotic, an anti-diabetic medicine. And they found that all of them dampened algal growth by 4% to 22% compared to the controls that they used. What's more, the respiration of these biofilms was cut in half. And in one stream, the photosynthesis – this really important process that these biofilms need to survive – was cut by 99%.

Interviewer – Sarah Crespi
So those are really big numbers for this being detrimental to streams. But is this the kind of concentration or dose we'd see of those drugs in the wild?

Interviewee – David Grimm
Well, that's the million dollar question, and the researchers say they don't know. An expert that we consulted for this article thinks that the researchers are probably in the ballpark, which suggests that the impacts they're seeing may not be very off the mark. But that's definitely one question for future studies is to try to really get at what dosage is appropriate to look at the impact that it's having on these river and stream ecosystems.

Interviewer – Sarah Crespi
Okay. Is this something that we might see regulation for if these impacts are as large as these scientists think?

Interviewee – David Grimm
Yes. I mean, if there's a really big environmental impact, you might potentially see – at least in the United States – regulation under the Clean Water Act. So that, again, is something that needs to be further investigated.

Interviewer – Sarah Crespi
Okay. So what else do you have on the site this week, Dave?

Interviewee – David Grimm

Well, Sarah, for *Science*NOW, we've got a story about breath prints. It turns out each of us has a unique breath print just like a fingerprint, and our breath can even reveal what kind of drugs we've been taking or what kind of diseases we might be developing. Also, a story about early puberty and the link between early puberty and behavioral problems later in life. For *Science*Insider, our policy blog, we've got a story about whether Canadian scientists are being muzzled. Also, a story about a Chinese researcher who has been accused of economic espionage in Wisconsin. Finally, for *Science*Live, our weekly chat on the hottest topics in science, this week's *Science*Live is about Jurassic Park 20 years later. Two decades after the Steven Spielberg movie came out, how have our conceptions of dinosaurs changed since then? And this is going to be a video chat, and we're going to have one of the world famous dinosaur experts, Jack Horner – who was actually a consultant on all Jurassic Park movies – as one of our guests. Next week's *Science*Live is about genetic privacy. How much control do we have over our own DNA? So be sure to check out all of these stories on the site.

Interviewer – Sarah Crespi
Great. Thanks, Dave.

Interviewee – David Grimm
Thanks, Sarah.

Interviewer – Sarah Crespi
David Grimm is the editor for *Science*'s online daily news site. You can check out the latest news, and the policy blog, *Science*Insider, at news.sciencemag.org, where you can also join a live chat, *Science*Live, on the hottest science topics every Thursday at 3 p.m. U.S. Eastern time.